Gas gangrene has been extremely rare and has occurred only when the wound has been sutured primarily. When it does occur, treatment is by wide excision of the affected tissues combined with gentamicin by intramuscular injection. Hyperbaric oxygen therapy has been available and has been used in these cases.

FRACTURES

Civil unrest has meant a large increase in the number of fracture cases, and has doubled the average number of fractures of the shaft of the femur. Because of the pressure on beds plaster-of-Paris techniques using a number of prosthetic limb principles have been introduced. The quadrilateral ischial bearing long-leg plaster-of-Paris is used for fractures of the femur, and the patellar tendon bearing short-leg walking plaster is used for fractures of the tibia. Patients can be discharged from the ward in a few weeks time, some being in for as short a period as three weeks.

Many of the fractures of the knee joint are carried out as a form of punishment by terrorist organizations. However, the knee-cap itself is rarely injured, but the wound often involves the knee joint or shatters the lower end of the femur and often damages the popliteal vessels or nerves.

NERVE INJURIES

Nerve conduction tests are very helpful in the prognosis of nerve injuries. Most of them are in the nature of neuropraxia and recover in time. But if there is no recovery the nerve may require exploration when all the wounds are healed. If the defect is too large to repair, other procedures such as tendon transposition may be necessary to restore function.

VASCULAR INJURIES

Secondary haemorrhage has occurred from vascular repairs owing to infection. In a few cases late thrombosis has followed repair of vessels; its association with traction has been mentioned above.

AMPUTATION

Amputation may be necessary later because of persistent soft-tissue infection or severe osteomyelitis, particularly if associated with an irrecoverable nerve lesion. Vascular complications such as thrombosis of a graft or delay in attending to a vascular injury until a false aneurysm or arteriovenous fistula forms may necessitate amputation.

Contemporary Themes

The Emigration of Doctors: A Problem for the Developing and the Developed Countries. Part II*

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Steps Taken to Prevent Doctors from leaving

COMPULSORY PERIODS OF SERVICE

The Parliament of Ceylon in 1961 passed legislation to make public service compulsory for graduates of the University of Ceylon and made specific reference to medical graduates. This law is being strictly enforced for doctors, and a compulsory five-year period of service after qualification is required by law. The effect of this legislation has really never been studied.

The first and most important effect is a loss to the country of graduates with five years' experience rather than those with one year's experience, since as soon as the five-year compulsory period is over doctors who want to go will leave. The loss of a doctor after five years of training means that at about the time that he is able to take full responsibility and could help in the training of others he leaves the country.

Secondly, the erection of a "fence" invariably presents a challenge to the ingenuity of those "fenced in" to find devious means of getting out. The cleverer and more ingenious medical students leave after the M.B. B.S. examination (while they are still students and before the examination results are released, which could make them doctors).

Finally, a very important effect is that it results in the retention of a group of dissatisfied and frustrated doctors who stay in the country because they are compelled to do so and not because they want to. It cannot be too strongly stressed that an efficient health service cannot be run under these circumstances, and the chaos in the medical services in this country is partly attributable to this.

BONDS

Those who have been sent abroad for training are being made to sign heavy financial and compulsory service bonds. Surprisingly, this includes university staff who go on sabbatical leave at the end of seven years' service to the country. This short-sighted policy will result in doctors remaining in this country without progressing in their field, since many do not wish to commit themselves to long periods of service (for example, seven to ten years) or the payment of large sums of money.

PERMISSION TO LEAVE THE ISLAND

Professional people, especially doctors, need the prime minister's approval before they are allowed to leave the country even on a

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holiday or conference abroad. These restrictive measures on personal freedom have a strong deterrent action on the return to this country of those who are working abroad.

The loss from Sri Lanka of 109 doctors during 1971-2 is ample evidence of the failure of the Government to cope with the problem of the doctor who leaves and does not return. With this documented failure to solve the problem there is little doubt that new and more ingenious (but ineffective) attempts will be forthcoming unless some satisfactory solution is found.

A much more subtle and dangerous suggestion to stop the "brain drain" is to lower the standards of medical training (for example, by a three-year course for the M.B., B.S.), to teach medicine in a language other than English, and to try deliberately to see that the degree granted is not recognized by world bodies. The finished product will then remain in this country, since no one else wants to have him. If this policy of self-destruction is implemented (as is likely), it would certainly stop the exit of doctors. Apart from lowering the standards of medicine in this country it will soon create an even more major problem of the mass migration of entire families who will prefer to give their children a proper education. There is some indication that this mass migration has already started. A similar but less dangerous suggestion is that the developing countries should train more medical auxiliaries.[8] In Pakistan, it costs the same to train 24 medical assistants as it does to train one doctor, and this differential cost is even greater since half of these doctors emigrate. Though there is undoubtedly a place for medical auxiliaries in developing countries,[14] and their production could solve some of the problems there, attempts to replace doctors with auxiliaries with limited training will inevitably lead to a lowering of the standards of medical care. To have more paramedical and auxiliary personnel to assist but not replace doctors in developing countries might well be worth exploring.

Cost of Training

The training of a doctor for the five years in medical school costs between Rs. 28 000-38 000 (£1800-£2500)[15] and post-graduate training (abroad) for two years has been estimated at an additional Rs. 58 000 (£3700). This is only a fraction of what it costs to train doctors in the developed countries, but in terms of the gross national product of this country the doctors represent a considerable national investment. The loss of doctors, especially the specialists who have recently been leaving this country in large numbers, is a drain on the national resources and the loss of a major investment. The migration to the developed countries of doctors trained in the developing countries is a good example of the developing countries subsidizing the developed ones.

Few developed countries appreciate that, if only for economic reasons, the supply of doctors from the developing countries must sooner or later cease. Herein lies the importance of appreciating this problem and the urgency for action.

Relative Costs of Training Doctors

The problem in Sri Lanka is the availability of more trainable people than training facilities, and this holds true of some developed countries such as the United Kingdom and Australia. What makes the situation in Sri Lanka (and some of the other developing countries) unique is the greatly reduced cost of providing this training.

In the United States[16] the mean annual cost of training undergraduates in 1967-8 was $3700 (range $2800 to $4300),[16] which would mean a total expenditure of some $18 500 (range $14 000 to $21 500) for the five-year undergraduate period. With an annual increase of about 7% in the cost of training, this figure is likely to have increased by about 40% over the past six years and a current figure of $25 500 for the five-year course is more likely to be correct.

The best British estimates are those of Hill,[17] who worked out a figure of £2000 per year, or £10 000 for the five-year undergraduate period. Now, some 10 years after this estimate, the cost is probably twice this. In fact, the rapidly increasing cost of education in the western countries makes estimates of cost out of date almost as soon as the figures are published.

Numerous studies[18] and the publication of data on the cost of medical education indicate the concern the developed countries are showing about the high and rising cost of training doctors. Much of this expenditure is due to the very high cost of establishing and running medical schools and hospitals in these countries, which in turn is due to the high cost of living and the high salaries that have to be paid to the staff. The production of doctors almost on a commercial basis in developing countries is something that the developed nations must seriously consider. This idea is nothing new. It is being extensively employed in industry, where, because of the relatively low cost of labour in the East, many western commercial firms have their products assembled under supervision in countries such as Hong Kong and Japan.

Problems Facing the Developed Countries

SHORTAGE OF DOCTORS FOR SERVICE NEEDS

The shortage of doctors in the developed countries and the consequent job opportunities provide a major "pull" factor. In Britain for example, Kilgour[5] estimated that there was an annual demand for some 3000 doctors while the total output of the British medical schools in 1969 was less than 2100 doctors, which immediately provided job opportunities for nearly 1000 doctors that year. The most important reason for the shortage of doctors in developed countries is the high cost of training doctors there. But in some rich African and Middle Eastern countries which could easily afford a training programme there is a shortage of trainable manpower, probably owing to the relatively recent westernized system of education.

Whatever the reasons may be for the shortage of doctors in the developed countries, it is obvious that any programme for the retention of an adequate number of doctors to man the health services in the developing countries must also ensure that the developed countries do not have a shortage of doctors. As Henderson[19] has observed, an important factor contributing to the world-wide migration of doctors to the United States has been the shortage of manpower in fields such as medicine and engineering which have provided job opportunities for immigrants. The cost of providing medical education in the developed countries is so high that the importing of doctors is relatively inexpensive, and the salaries offered are so attractive to foreign graduates that it enables affluent countries to meet their public responsibilities at the expense of some of the poorest nations in the world.

GUILT COMPLEX

This results in more and more conferences on the brain drain but very little action to stop it. It also results in numerous scholarships and fellowships which makes matters worse. Though it has rarely been expressed, many observers in developed countries must realize that the giving of numerous scholarships and fellowships to doctors in the developing countries undoubtedly contributes to the brain drain. If the developed nations really want to assist the underdeveloped ones in the training of their doctors, it would be far better to send their teachers to the developing countries. This has been done by the Canadian Government, and the best Canadian teachers work in the University of Kenya for a period. This sort of genuine help will undoubtedly reduce the brain drain.

LOWERING STANDARDS

A study of the quality of medical care provided by foreign medical graduates in the United States[20] showed that there was a significantly lower level of professional competence when compared with their American and Canadian counterparts. Though various competence tests such as a certificate from the Educational Council for Foreign Medical Graduates (E.C.F.-M.G.) have been introduced, the obvious inadequacy of these measures is shown by the fact that the above study was done in the very country which has this apparent check. It would be far better if some of these countries sent out their teachers to work in the medical schools of countries which supply them with doctors.

SOCIAL PROBLEMS

If the developed countries are unable to or unprepared to train their own doctors, their society will have to learn to live with foreigners who have a different culture and colour.

Summary of the Problem

Certain basic points must be appreciated before any plan of action is formulated.

(1) The conditions of work and the salaries paid by the developing countries are far inferior, and will always be inferior, to those obtainable in the richer countries. These cannot be altered unless there is a vast improvement in the economy of the developing countries and will not occur in the foreseeable future.

(2) Despite these shortcomings there are a number of doctors in the developing countries who will stay in or who will return to their country if certain existing deficiencies (which do not involve money) are corrected in these countries.

(3) Doctors from developing countries may like to return home for a period of time provided they feel free to leave if and when they want to do so.

(4) The competition between developed and developing countries for doctors must be prevented. This can be achieved only by having an adequate supply of doctors for both the developed and the developing countries.

(5) There is a tremendous reservoir of trainable talent in some developing countries, such as Sri Lanka, India, and Pakistan, which have had long associations with the West. This vast potential cannot be tapped, since these countries are short of money to provide facilities for the training of more than a fraction of those who are trainable.

A Possible Solution

Barriers to prevent doctors from leaving or entering some countries will not solve this problem. A possible solution is for the developing nations to make conditions at home more "attractive." As McGregor[12] accurately puts it, "attractiveness" to a doctor or research worker means the opportunity to work, to fulfil himself, and to achieve. However, the rigid hierarchical system of seniority, nepotism, and administrative ineptitude that he mentions is too entrenched in many developing countries to be easily changed.

A solution to the problem which has not so far been considered is the simple economic principle of meeting the demand with an adequate supply. Specific aid could be given for the supervised production of sufficient numbers of doctors in countries where their production would cost least. As is the case with any other investment, some supervision would be essential to guarantee the quality of the end product.

From the point of view of the developed countries it is a considerable financial investment, which, however, will ensure a steady stream of skilled technical manpower on a permanent and lasting basis. From the point of view of the developing countries it will mean a steady inflow of much-needed foreign exchange. Once the barriers are removed, it will also mean a return of those who want to come back (perhaps for a period of time). The developing countries must sooner or later realize that it is better to have a migrant population of doctors than no doctors at all. Most important, it will result in a satisfied medical profession who are where they are because they want to do a job of work. Doctors, like other human beings, must remain in a country because they want to, and not because they are compelled to.

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References

[1] Compulsory Public Service Act No. 70, 1961. Parliament of Ceylon 2nd session 1961-2. Government Press, Ceylon.
[2] The Colombo Plan for Co-operative Economic Development in South-East Asia. The Special Topic: "Brain Drain". Country Papers, the Working Paper, and the Report of the Special Topic Committee prepared for the Meeting of the 22nd Consultative Committee, 1972. The Colombo Plan Bureau, Colombo 4, Sri-Lanka (Ceylon).
[3] U.S. Immigration and Naturalization Service, *Annual Report*, E.Y. 1971.
[4] *Research trainees in the Health Services* (Ottawa Medical Council Report No. 4, 1970).
[5] Kilgour, J. L., in *Migration and Medical Manpower*, ed. J. Z. Bowers and Lord Rosenheim. The Macey Foundation Series on International Problems of Medical Education. New York, Josiah Macey Jr. Foundation, 1971.
[6] Central Medical Recruiting Committee Index, 1969.
[7] *Report of the Institute of Applied Manpower Research of India*, 1968.
[8] Chouduri, A. S., in *Migration of Medical Manpower*, ed. J. Z. Bowers, and Lord Rosenheim. The Macey Foundation Series on International Problems of Medical Education. New York, Josiah Macey Jr. Foundation, 1971.
[9] Munasinghe, S. S., Chandraraj, E. J., and Simeonov, L. A., *National Health Manpower Study in the Republic of Sri Lanka. Interim report on substudy C, Census of Doctors.* Health and Programming division, Ministry of Health, Republic of Sri Lanka, 1973.
[10] *I.L.O. Report Matching Employment Opportunity and Expectations. A programme of Action for Ceylon.* Technical papers of an interagency team organized by the International Labour Office, Geneva, 1971.
[11] National Council of Higher Education, *The Framework of a Plan for the Development of Universities in Ceylon.* 1969-78, mimeographed pp. 28-34. 1969.
[12] McGregor, M., in *Migration of Medical Manpower*, ed. J. Z. Bowers and Lord Rosenheim. The Macey Foundation Series on International Problems of Medical Education. New York, Josiah Macey Jr. Foundation, 1971.
[13] *Report of the Royal Commission on Medical Education*, Cmnd. 3569. London, H.M.S.O. 1968.
[14] Gisch, O., *Lancet*, 1973, 1, 1251.
[15] Wijesinghe, C. P., and Zarkovic, G., *National Health Manpower Study in the Republic of Sri Lanka. Substudy B, Medical Education.* Republic of Sri Lanka, Health Planning and Programming Division, Ministry of Health, 1973.
[16] Entwisle, G., *Journal of Medical Education*, 1971, **46**, 117.
[17] Hill, K. R., *British Medical Journal*, 1964, **1**, 300.
[18] Carrol, A. J., and Darley, W., *Journal of Medical Education*, 1967, **42**, 1.
[19] Henderson, G., Report on Immigration Totals, Tufts University, March 1972.
[20] Margulies, H., Bloch, L. S., and Cholko, F. K., *Journal of Medical Education*, 1968, **43**, 706.